Postoperative outcomes in intimal aortic angiosarcoma: A case report and review of the literature

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Intimal angiosarcoma is a most unexpected cause of aortic occlusion. We present the case of a 74-year-old woman with intimal angiosarcoma that manifested with the triad of congestive heart failure, acute renal failure, and abdominal angina. A review of the literature and discussion of postoperative outcomes follows. (J Vasc Surg 2009;50:186-9.)

Intimal sarcomas of the aorta may be divided into two categories based on immunohistochemical staining. Intimal myofibroblastic sarcomas arise from mesenchymal cells, and are more common. Intimal angiosarcomas from endothelial cells.[1] The role of surgery for this rare and highly fatal entity is uncertain. Palliative and curative operations have been attempted, and both en bloc resection and endarterectomy have been proffered as curative operations. We endeavored to characterize differences in survival between patients undergoing en bloc resection and endarterectomy.

CASE REPORT

A 74-year-old woman presented to an outside hospital with complaints of steadily increasing abdominal discomfort, intermittent chest discomfort, and dyspnea on exertion. She described several weeks of vague and generalized postprandial abdominal pain occasionally accompanied by nausea. The pain was such that she became averse to eating, ultimately resulting in a 20-pound weight loss.

She was discharged, but presented again to the hospital 3 weeks later. Her abdominal pain had not remitted, her dyspnea had worsened, and additionally, she complained of profound fatigue and weakness. She was found to be tachypneic and hypoxic, with an oxygen saturation of 88% on room air. Her abdomen was soft but with mild diffuse upper abdominal discomfort. She had an abdominal bruit and palpable pulses at all extremities. Laboratory testing revealed a blood urea nitrogen level of 38 mg/dL and serum creatinine level of 3.9 mg/dL in this patient with previously normal renal function. Chest radiograph revealed pulmonary congestion without signs of consolidation. To corroborate the finding of congestive heart failure, β-natriuretic peptide was analyzed and was found to be elevated at 1551 pg/mL.

Transthoracic and transesophageal echocardiogram results were consistent with mild diastolic dysfunction and a left ventricular ejection fraction of 50% without valvular disease. Hemodialysis was started in light of the patient's worsening renal and pulmonary function.

The results of an extensive multisystem workup were significant for an erythrocyte sedimentation rate (ESR) of 106 mm/h and a C-reactive protein (CRP) level of 89.9 mg/L. White blood cell count peaked at 15,000/μL. A magnetic resonance angiogram revealed a focal "coral reef" type plaque within the visceral segment of the aorta that was occluding the superior mesenteric and right renal arteries, as well as causing a high-grade stenosis of the celiac trunk. The inferior mesenteric artery was enlarged, supplying the gut through collateral circulation (Fig 1). The patient was transferred to our institution.

The initial diagnosis was that the patient had aortic occlusive disease from a calcified plaque, creating a shaggy aorta. In short course, aortic and eversion endarterectomy of the left renal, celiac, right renal, and superior mesenteric arteries were performed through an oblique thoracoabdominal incision along the eighth intercostal space to the level of the umbilicus. Grossly, a cauliflower-like gelatinous mass emanated from the intima, nearly occluding the aortic lumen (Fig 2). Although the intraoperative findings were unusual, the diagnosis of intimal sarcoma was not suspected and frozen sections were not sent for analysis.

Final pathologic analysis, however, revealed a poorly differentiated malignant neoplasm consistent with a high-grade epithelioid angiosarcoma. The tumor was contained entirely within the aortic lumen. Immunohistochemical analysis revealed CD31 and vimentin positivity, with patchy areas staining for CD34 and a focal area of mouse monoclonal-116 (Fig 3). Significant negative stains included actin, desmin, melanoma antigen recognized by T-cells (MART-1), leukocyte common antigen (LCA), S100, and human melanoma black (HMB)-45. The morphology in situ as well as the histologic findings confirmed this tumor to be a primary aortic intimal angiosarcoma. The distal margin of the specimen was positive for microscopic disease.

The patient tolerated the operation without major complication. It was thought that a reoperation and en bloc resection of the affected aorta and vessels would not be tolerated by the patient. In consultation with the medical and radiation oncology teams, the patient was recommended to receive doxorubicin and external-beam radiation adjunctive therapy, which she opted not to pursue. She is alive 12 months after the operation, without evidence of congestive heart failure, renal failure, or of tumor recurrence.

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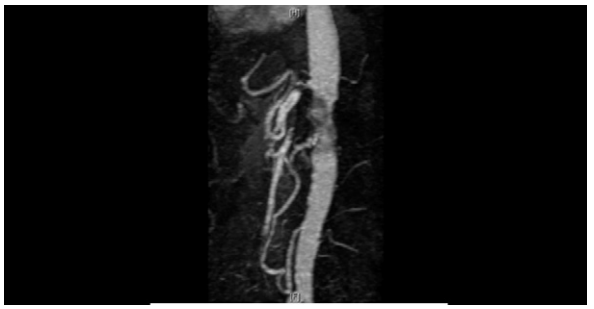

Fig 1. Magnetic resonance imaging shows the infrarenal aortic angiosarcoma has occluded the celiac, superior mesenteric, and right renal arteries. The inferior mesenteric artery is patent.

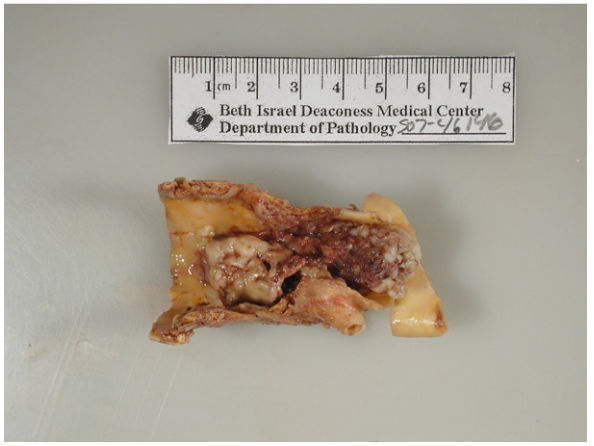

Fig 2. Gross specimen of the infrarenal aortic angiosarcoma.

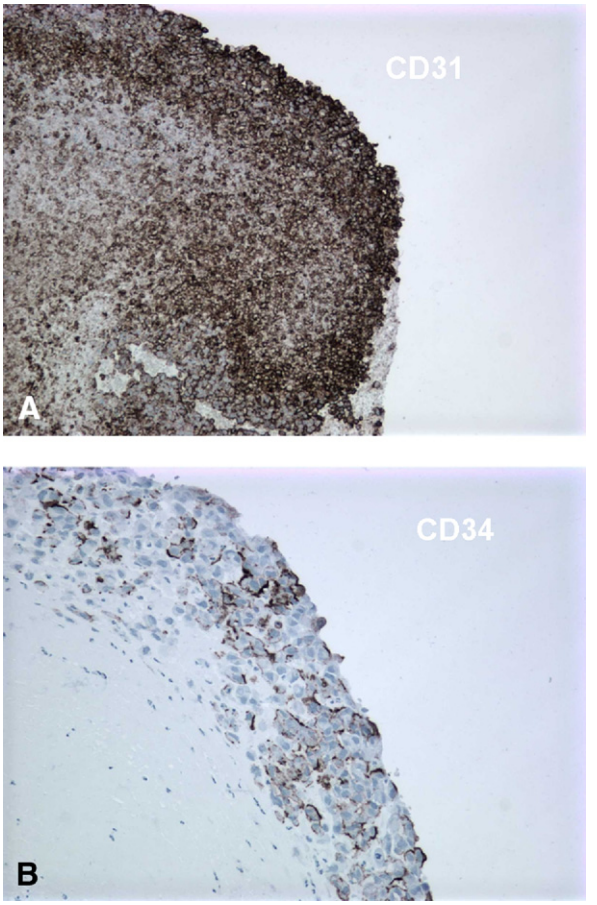

Fig 3. A, The specimen stains strongly for CD31 and **(B),** exhibits patchy staining for CD34.

METHODS

A literature review was undertaken of all reported cases of aortic intimal sarcoma dating back to the first reported case in 1873 using PubMed's searchable database. Cases were eliminated from analysis if surgical treatment was not undertaken, no survival data were reported, or if no attempt was made at removing the tumor. Demographic information including, age, gender, survival, type of operation, and excisional margin status were collected. The data were pooled and compared using the Wilcoxon rank sum test. Statistical analysis was conducted using the SAS/STAT software (SAS Institute Inc, Cary, NC).

RESULTS

Of the 35 cases reported in the literature, 30 underwent surgical treatment. Five patients were eliminated from analysis because they underwent an operation in which no attempt was made at removing the tumor either by endarterectomy, or by an en bloc resection. In these five eliminated patients, the obstruction was bypassed or simple thrombectomy alone was undertaken. Two cases were eliminated because of a lack of survival data. Seven of the remaining 23 patients underwent endarterectomy (group I), and 15 underwent resection with placement of an interposition graft (group II). One patient underwent endarterectomy initially, and en bloc resection one year later. Negative margins were documented pathologically in nine. Embolic disease to the lower extremities was present in nine, and to both the lower extremity and to the small intestine in one (Table I).

No significant difference was noted in either age or gender between the two groups. Median survival was 17.1 months in the en bloc resection group and 10.5 months in the endarterectomy group ($P = .98$; Table II). Longer survival was seen in patients undergoing an operation in which clean margins were obtained (17.8 months vs 13.1 months, $P = .63$). En bloc resection conferred a further survival advantage (21 months vs 6.5 months, $P = .28$; Table III). Patients who presented with embolic disease were at a distinct survival disadvantage (9.9 months vs 17.9 months, $P = .23$), regardless of the type of operation (Table IV).

DISCUSSION

Unlike most intimal angiosarcomas that present with signs and symptoms from thromboembolic disease, our patient presented with a nearly occlusive aortic lesion and

Table I. Length of survival and causes of death after surgical resection

Reference									
First author	*Journal*	*Year*	*Age/sex*	*Tumor location*	*Operation*	*Clean margins?*	*Length of survival*	*Cause of death*	*Embolic disease?*
Weiss	J Vasc Surg	1991	56/M	Infrarenal aorta	EBR	Yes	>11 mon	Not mentioned	No
Burke	Cancer	1993	63/F	Aortoiliac bifurcation	EBR	No	1 mon	Not mentioned	No
Burke	Cancer	1993	68/F	AA to femoral arteries	EBR	No	5 mon	Not mentioned	No
Burke	Cancer	1993	58/M	Descending TA	EBR	No	16 mon	Not mentioned	No
Settmacher	Vasa	1997	55/M	TAA to infrarenal aorta	EBR	Yes	>6 mon	Not mentioned	No
Seelig	J Vasc Surg	1998	71/M	Infrarenal, recurrence at descending TA	EA	Yes	35 d	Cardiac arrest	Yes
Clark	J Vasc Surg	1998	76/M	Infrarenal, recurrence at descending TA	EBR	No	>2 ys	Not mentioned	Yes
Majeski	J Vasc Surg	1998	69/M	Infrarenal	1) EA, 2) EBR	1) Yes 2) Yes	1) 1 y; 2) 7 y	Sepsis	No
Hottenrott	Virch Arch	1999	68/M	AA	EA	No	>5 mon	Not mentioned	No
Le Rochais	Eur J Vasc Endovasc Surg	1999	78/F	Descending TA	EBR	Yes	5 mon	Profound cachexia	Yes
Hottenrott	Virch Arch	1999	69/F	Infrarenal aorta	EA	No	>1 y	Not mentioned	No
Pompilio	Eur J Cardiovasc Thorac Surg	2002	39/M	Prox descending TA	EBR	Yes	9 mon	Cachexia	Yes
Shuster	Ann Vasc Surg	2002	47/M	Infrarenal AA to bifurcation	EBR	No	>48 mon	Not mentioned	No
Bohner	J Vasc Surg	2003	63/F	Descending TA	EA	No	>6 mon	Not mentioned	No
Bohner	J Vasc Surg	2003	69/F	AA	EA	No	20 mon	"Disseminated metastases"	No
Chiche	Ann Vasc Surg	2003	65/M	Descending TA to infrarenal aorta	EBR	No	7 mon	"Deterioration from general status"	Yes
Chiche	Ann Vasc Surg	2003	59/F	TAA to infrarenal aorta	EA	No	16 mon	Progressive cachexia	No
Thalheimer	J Vasc Surg	2004	75/F	AA	EBR	Yes	12 wk	Hypercalcemia, hemolysis, MOF	Yes
Abularrage	Ann Vasc Surg	2005	77/M	Infrarenal aorta to bilateral iliac arteries	EBR	No	3 mon	"Succumbed to his disease"	Yes
Rudd	J Am Acad Dermatol	2005	59/M	Infrarenal AA to left common iliac	EBR	No	8 mon	"Died of his disease"	Yes
Akiyama	Ann Thorac Cardiovasc Surg	2005	63/M	Descending TA to bifurcation	EBR	Yes	29 mon	Multi-organ failure	Yes
Kim	Heart	2006	49/M	Descending TA	EBR	No	14 mon	Profound cachexia	No
Dehqanzada	J Surg Ed	2007	47/M	Infrarenal aorta to bifurcation	EA	No	>1 y	Not mentioned	No

AA, Abdominal aorta; *EA,* endarterectomy; *EBR,* en bloc resection; *MOF,* multiorgan failure; *TA,* thoracic aorta; *TAA,* thoracoabdominal aorta.

Table II. Patient characteristics

Characteristic	*All patients*	*Endarterectomy*	*En bloc resection*	P
Patients, No.	23	8	16	
Age, average (SD), y	63	64.4 (8.1)	62.3 (11.5)	.58
Men, No.	16	4	12	.22
Evidence of embolic disease	9	1	8	NA
Overall survival, mo				
Mean (SD)	14.9	10.5 (6.2)	17.1 (21.6)	.98
Median	10	12	8.5	

Mo, months; *SD,* standard deviation; *y,* years.

manifested the constellation of congestive heart failure, acute renal failure, and abdominal angina. Disease in the right renal, celiac, and superior mesenteric arteries was from direct extension of the primary tumor, and she had palpable lower extremity pulses. One other report of such a presentation has been published.[2] After undergoing endarterectomy of the celiac artery, renal arteries and affected portion of the aorta, the patient survived 16 months and died of "progressive cachexia" (Table I).

Many reports of intimal aortic angiosarcoma suggest that outcomes from endarterectomy and a more aggressive en bloc resection were roughly equivalent.[1-3] Others suggest

Table III. Length of survival by type of operation and margin status

Variable	*No. of operations (n = 24)*	*Survival, mean (SD), mon*	P
Overall survival			
Clean margins	9	17.8 (26.2)	.63
Margins involved	15	13.1 (11.6)	
Endarterectomy			
Clean margins	2	6.5 (7.8)	.50
Margins involved	6	11.8 (5.7)	
En bloc resection			
Clean margins	7	21 (29.1)	.58
Margins involved	9	14 (14.7)	
Clean margins by operation			
En bloc	7	6.5 (7.8)	.28
Endarterectomy	2	21 (29.1)	

SD, Standard deviation.

Table IV. Survival by presence of embolic disease

Variable	*No. of operations (n = 24)*	*Survival, mean (SD), mon*	P
Overall survival			
Embolic disease	9	9.9 (9.8)	.23
No embolic disease	14	17.9 (21.3)	
Endarterectomy			
Embolic disease	1	(N/A)	N/A
No embolic disease	7	11.9 (5.2)	
En bloc resection			
Embolic disease	8	11 (9.9)	.31
No embolic disease	8	23.1 (11.9)	

N/A, Not applicable; *SD,* standard deviation.

that an en bloc resection of the affected aorta with interposition graft placement should be performed ideally.[4,5] Our analysis showed that patients undergoing en bloc resection had worse median survival, but better mean survival. Our conclusions are limited, however, by the small numbers of cases that have been reported of this very rare tumor.

Given the highly aggressive nature of the tumor, it is not surprising that patients with intimal angiosarcoma generally died as a result of metastatic disease. The most common site was to the bone, which occurred in eight patients, although in one patient each it had spread to kidney, duodenum, liver, peritoneum, and lung. The most frequent causes of death noted among the patients who underwent an attempt at curative resection were profound cachexia, sepsis, and multisystem organ failure. Patients who presented with embolic disease had poorer survival.

Our patient was noted to have quite significant elevations in ESR and CRP. Brigden[6] described the utility of the ESR in diagnosing a panoply of inflammatory conditions and concluded that a value >100 mm/h has a 90% positive predictive value for serious disease, including malignant tumor. Other case reports of intimal angiosarcoma also noted an ESR >100 mm/h, and one noted an ESR of 70 mm/h.[7,8]

It has been suggested that one should suspect an aortic sarcoma if a patient presents with symptoms of arterial occlusion or thromboembolism, a normal echocardiogram result, and the finding of a heterogeneous protruding aortic plaque in the absence of generalized atherosclerotic disease.[3,8,9] In concert with these findings, an elevated ESR, particularly if it is >100 mm/h, may increase one's suspicion for the diagnosis.

CONCLUSIONS

A case of angiosarcoma of the aorta treated by endarterectomy is presented. Elevation of the ESR, especially if >100 mm/h, may help to distinguish this from the more common coral reef aortic plaque. If the patient has embolic disease at the time of presentation, the outlook is very poor and surgical therapy may not be indicated. Selection bias notwithstanding, en bloc resection confers better long term survival, although no results reached statistical significance. As expected, positive margins are associated with a shorter survival.

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